CLAIMS

What is claimed is:

1	1. A method for designing a system on a target device utilizing field programmable gat
2	arrays (FPGAs), comprising:
3	synthesizing a design for the system;
4	mapping components in the design onto resources on the target device;
5	determining placement locations for the components on the target device; and
6	identifying components to replicate in response to criticality determined from the
7	placement locations.
1	2. The method of Claim 1, wherein identifying components to replicate comprises
2	identifying a replication candidate with associated slack that exceeds a threshold value.
1	3. The method of Claim 2, further comprising determining a location for a duplicate of
2	the replication candidate.
1	4. The method of Claim 3, further comprising determining slack gain associated with the
2	duplicate of the replication candidate at the location.
1	5. The method of Claim 4, further comprising computing a gain value for the duplicate
2	of the replication candidate.
1	6. The method of Claim 5, wherein computing the gain value comprising evaluating
2	slack gain, the associated slack of the replication candidate, and illegalities associated with
3	placement at the location.

1	7. The method of Claim 5, further comprising designating n components with a highest
2	gain value as the components to replicate.
1	8. The method of Claim 1, further comprising performing incremental placement on
2	duplicates of the components to replicate.
1	9. The method of Claim 8, further comprising:
2	identifying additional components to replicate; and
3	performing incremental placement on the duplicates of the additional components to
4	replicate.
1	10. The method of Claim 8, further comprising routing the components and the
2	duplicates of the components to replicate.
1	11. The method of Claim 1, further comprising removing a duplicate if a location of the
2	duplicate is in a logic array block with its corresponding component to replicate.
1	12. The method of Claim 8, further comprising determining system slack for the system.
1	13. The method of Claim 12, further comprising restoring the system to its previous
2	design if the system slack has decreased.
1	14. A method for designing a system on a target device utilizing field programmable gate
2	arrays (FPGAs), comprising:
3	determining placement locations for components on the target device;
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4	identifying components to replicate in response to criticality determined from the
5	placement locations; and
6	performing incremental placement to resolve an illegality in placement of a duplicate of
7	component to replicate.
1	15. The method of Claim 14, wherein identifying components to replicate comprises
2	identifying a replication candidate with associated slack that exceeds a threshold value.
1	16. The method of Claim 15, further comprising determining a location for a duplicate of
2	the replication candidate.
1	17. The method of Claim 16, further comprising determining slack gain associated with
2	the duplicate of the replication candidate at the location.
1	18. The method of Claim 17, further comprising computing a gain value for the duplicate
2	of the replication candidate.
1	19. The method of Claim 18, wherein computing the gain value comprising evaluating
2	slack gain, the associated slack of the replication candidate, and illegalities associated with
3	placement at the location.
1	20. The method of Claim 18, further comprising designating n components with a highest
2	gain value as the components to replicate.
1	21. The method of Claim 14, wherein performing incremental placement to resolve
2	illegalities in placement of duplicates of the components to replicate comprises:

•	generating a proposed move for the duplicate,
4	generating cost function values for a current placement with the proposed move; and
5	accepting the proposed move if its associated cost function value is better than the cost
6	function value of the current placement.
1	22. The method of Claim 21, wherein generating the proposed move comprises moving
2	the duplicate to a logic-array block (LAB) that is a fanin of the duplicate.
1	23. The method of Claim 21, wherein generating the proposed move comprises moving
2	the duplicate to a logic-array block (LAB) that is a fanout of the duplicate.
1-	24. The method of Claim 21, wherein generating the proposed move comprises moving
2	the duplicate to a logic-array block (LAB) that is a sibling of a LAB where the duplicate resides.
1	25. The method of Claim 21, wherein generating the proposed move comprises moving
2	the duplicate to a logic-array block (LAB) that is adjacent to the duplicate.
1	26. A machine-readable medium having stored thereon sequences of instructions, the
2	sequences of instructions including instructions which, when executed by a processor, causes the
3	processor to perform:
4	synthesizing a design for a system;
5	mapping components in the design onto resources on a target device;
5	determining placement locations for the components on the target device; and
7	identifying components to replicate in response to criticality determined from the
3	placement locations.

•	27. The machine-readable medium of Claim 26, wherein identifying components to
2	replicate comprises identifying a replication candidate with associated slack that exceeds a
3	threshold value.
1	28. The machine-readable medium of Claim 27, further comprising instructions which
2	when executed further performs determining a location for a duplicate of the replication
3	candidate.
1	29. The machine-readable medium of Claim 28, further comprising instructions which
2	when executed further performs determining slack gain associated with the duplicate of the
3	replication candidate at the location.
1	30. The machine-readable medium of Claim 29, further comprising instructions which
2	when executed further performs computing a gain value for the duplicate of the replication
3	candidate.
1	31. The machine-readable medium of Claim 30, wherein computing the gain value
2	comprising evaluating slack gain, the associated slack of the replication candidate, and illegalities
3	associated with placement at the location.
1	32. The machine-readable medium of Claim 30, further comprising instructions which
2	when executed further performs designating n components with a highest gain value as the
3	components to replicate.
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1	33. The machine-readable medium of Claim 26, further comprising performing
2	incremental placement on duplicates of the components to replicate.

- 1 34. The method of Claim 1, wherein identifying components to replicate comprises
- 2 identifying a replication candidate with associated path delay that exceeds a threshold value.